

3RD INTERNATIONAL RED SEA EMERGENCY MEDICINE CONFERENCE



مستشفى الملك فيصل التخصصي ومركز الأبحاث
King Faisal Specialist Hospital & Research Centre
Gen. Org. مؤسسة عامة



الجمعية السعودية لطب الطوارئ
Saudi Society of Emergency Medicine

Targeted Temperature Management: What is the Perfect Temp?

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No Disclosure

What is the perfect Temperature??

- A. 33
- B. 34
- C. 36
- D. 37



Objectives

- Definitions
- Rational: How Does Hypothermia Work?
- Indications and contraindications
- What is the evidence?
- The Perfect temperature?





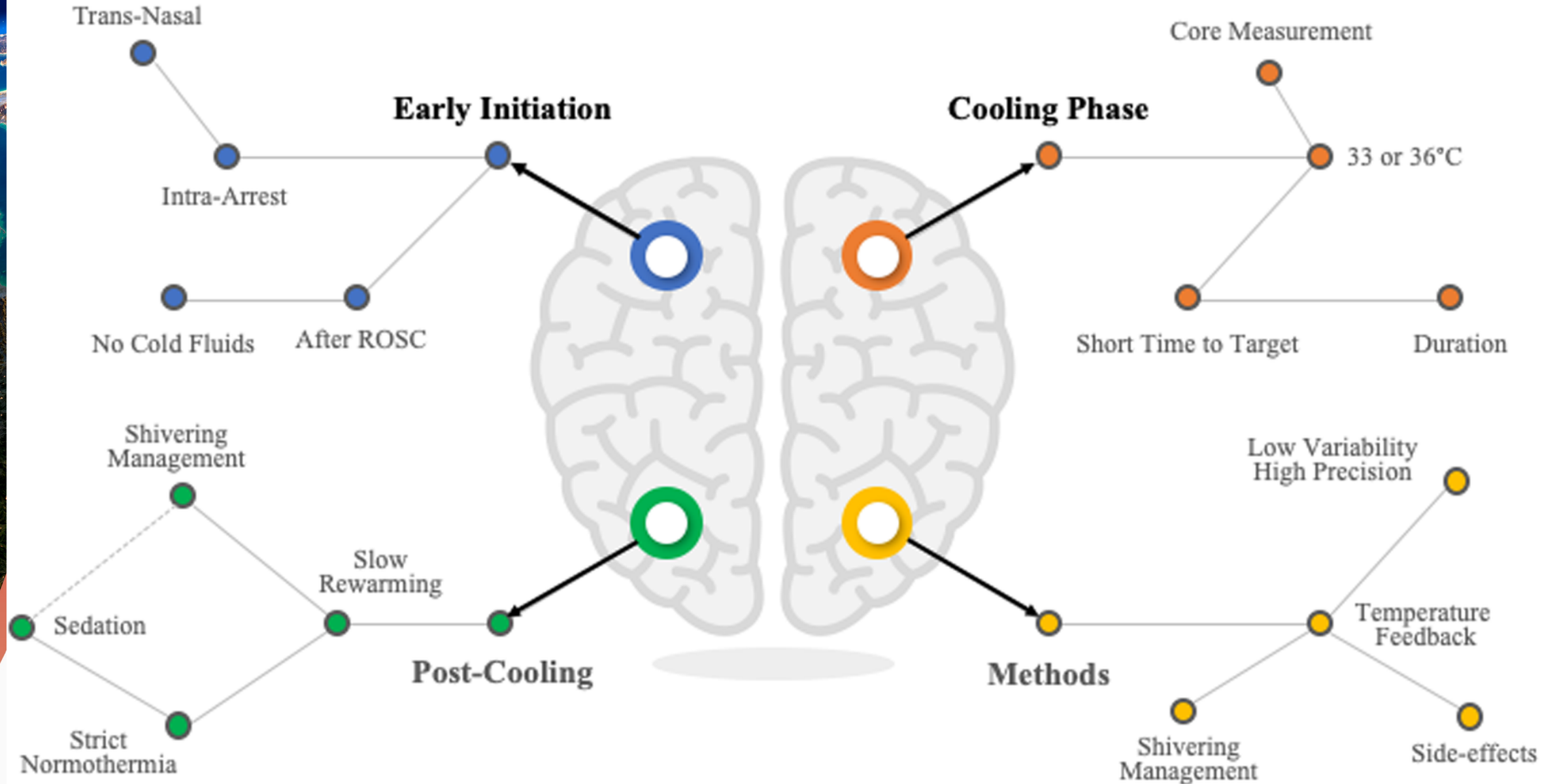
The greatest prognostic indicator of post-arrest survival and discharge home **is preventing neurological injury**; this is the goal of Targeted Temperature Management (TTM)

Definitions

- Therapeutic Hypothermia: 32 - 34 °C
- Targeted Temperature Management: $\leq 36^{\circ}\text{C}$



HIGH QUALITY TTM



Rational: How Does Hypothermia Work?

- **Neuroprotective Mechanisms:**
 - Decrease in cerebral metabolic rate
 - Decrease in acidemia
 - Decrease in glutamate release (↓ risk of seizures)
 - **Decrease in cerebral edema**
 - Decrease in free radical production
 - Decrease in cytokine release (Can lead to inflammation and fever)



Indications and contraindications

- **No absolute contraindications unless there was an advanced directive**
- **Indications: Post Cardiac Arrest**



TREATMENT OF COMATOSE SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST WITH INDUCED HYPOTHERMIA

STEPHEN A. BERNARD, M.B., B.S., TIMOTHY W. GRAY, M.B., B.S., MICHAEL D. BUIST, M.B., B.S.,
BRUCE M. JONES, M.B., B.S., WILLIAM SILVESTER, M.B., B.S., GEOFF GUTTERIDGE, M.B., B.S., AND KAREN SMITH, B.Sc.

- Bernard et al. 2002
- Small trial
- Selection Bias
- Not Blinded

TABLE 5. OUTCOME OF PATIENTS AT DISCHARGE FROM THE HOSPITAL.

OUTCOME*	HYPOTHERMIA (N= 43)	NORMOTHERMIA (N= 34)
	number of patients	
Normal or minimal disability (able to care for self, discharged directly to home)	15	7
Moderate disability (discharged to a rehabilitation facility)	6	2
Severe disability, awake but completely dependent (discharged to a long-term nursing facility)	0	1
Severe disability, unconscious (discharged to a long-term nursing facility)	0	1
Death	22	23

*The difference between the rates of a good outcome (normal or with minimal or moderate disability) in the hypothermia and the normothermia groups (49 percent and 26 percent, respectively) was 23 percentage points (95 percent confidence interval, 13 to 43 percentage points; $P=0.046$). The unadjusted odds ratio for a good outcome in the hypothermia group as compared with the normothermia group was 2.65 (95 percent confidence interval, 1.02 to 6.88; $P=0.046$). The odds ratio for a good outcome in the hypothermia group as compared with the normothermia group, after adjustment by logistic regression for age and time from collapse to return of spontaneous circulation, was 5.25 (95 percent confidence interval, 1.47 to 18.76; $P=0.011$).



MILD THERAPEUTIC HYPOTHERMIA TO IMPROVE THE NEUROLOGIC OUTCOME AFTER CARDIAC ARREST

THE HYPOTHERMIA AFTER CARDIAC ARREST STUDY GROUP*

- HACA 2002
- Randomized
- Trial was terminated early due to sponsoring issues
- Outcome Assessors were blinded





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THE HYPOTHERMIA AFTER CARDIAC ARREST STUDY GROUP*

TABLE 2. NEUROLOGIC OUTCOME AND MORTALITY AT SIX MONTHS.

OUTCOME	NORMOTHERMIA	HYPOTHERMIA	RISK RATIO (95% CI)*	P VALUE†
	no./total no. (%)			
Favorable neurologic outcome‡	54/137 (39)	75/136 (55)	1.40 (1.08–1.81)	0.009
Death	76/138 (55)	56/137 (41)	0.74 (0.58–0.95)	0.02

*The risk ratio was calculated as the rate of a favorable neurologic outcome or the rate of death in the hypothermia group divided by the rate in the normothermia group. CI denotes confidence interval.

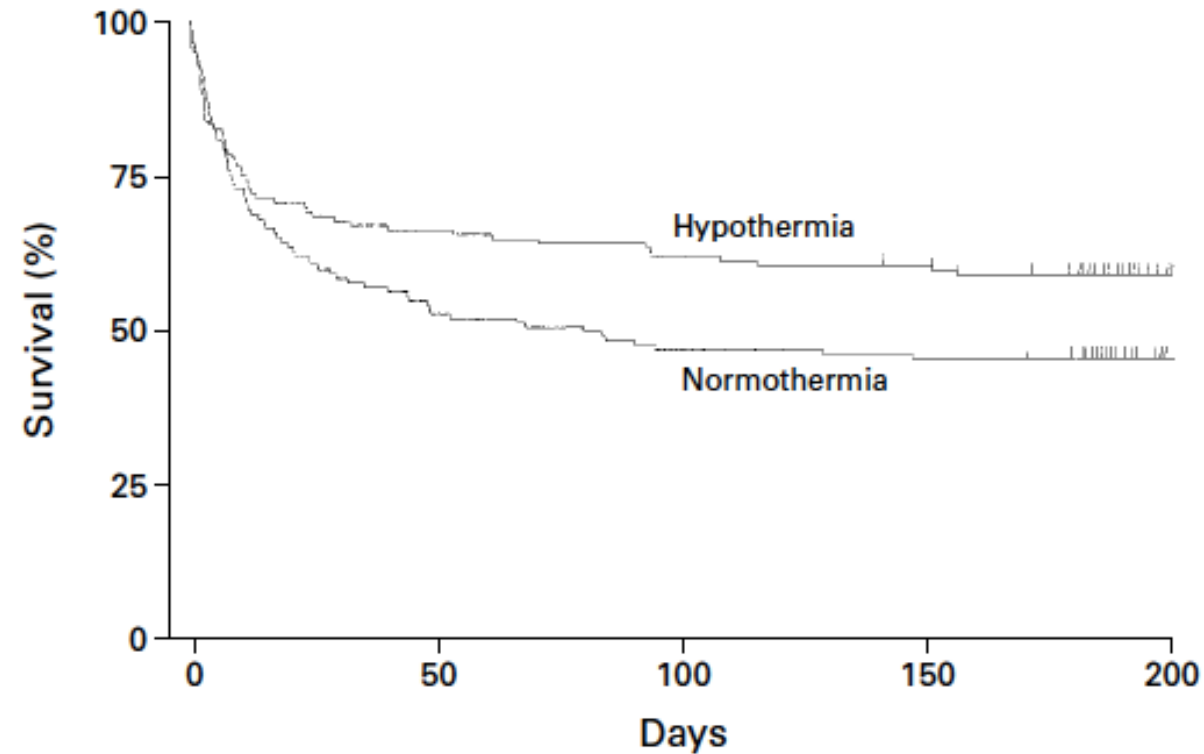
†Two-sided P values are based on Pearson's chi-square tests.

‡A favorable neurologic outcome was defined as a cerebral-performance category of 1 (good recovery) or 2 (moderate disability). One patient in the normothermia group and one in the hypothermia group were lost to neurologic follow-up.



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No. AT RISK

Hypothermia	137	92	86	83	11
Normothermia	138	74	66	64	9

Figure 2. Cumulative Survival in the Normothermia and Hypothermia Groups.
Censored data are indicated by tick marks.





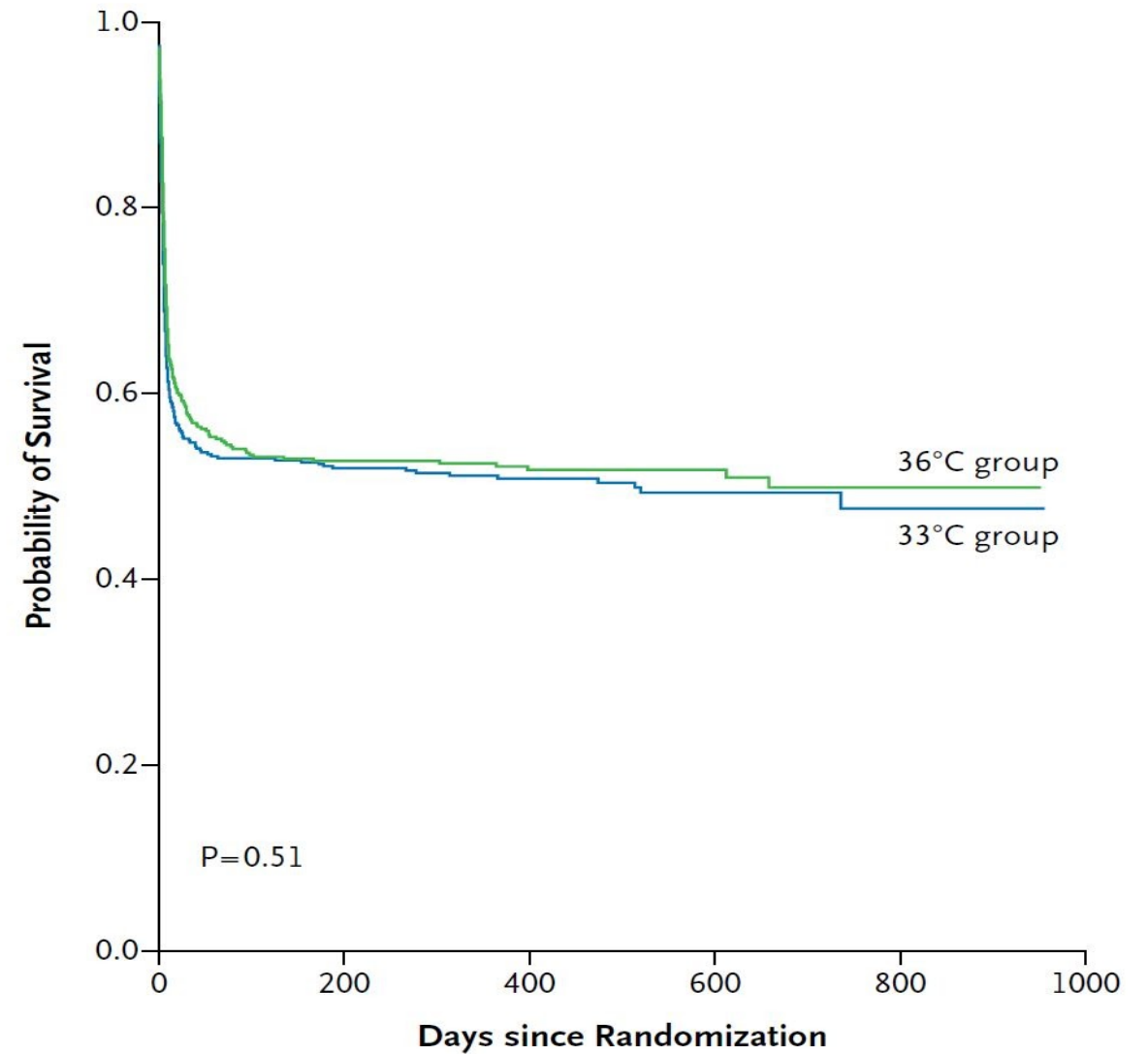
COOL THEM ALL !

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

- Nielson 2013
- Largest, Highest quality RCT to date
- No difference between 33 Vs 36 °C



- Nielson 2013



No. at Risk

33°C group	473	230	151	64	15
36°C group	466	235	144	68	12

Targeted Temperature Management for Cardiac Arrest with Nonshockable Rhythm

J.-B. Lascarrou, H. Merdji, A. Le Gouge, G. Colin, G. Grillet, P. Girardie,
E. Coupez, P.-F. Dequin, A. Cariou, T. Boulain, N. Brule, J.-P. Frat, P. Asfar,

- **The HYPERION Trial**
- Open-label, pragmatic, multi-centre RCT
- Intervention: Target temperature of 33°C for 24 hours, then a target temperature of 37°C for 24 hours
- Comparison: Targeted normothermia 37 °C for 48 hours.



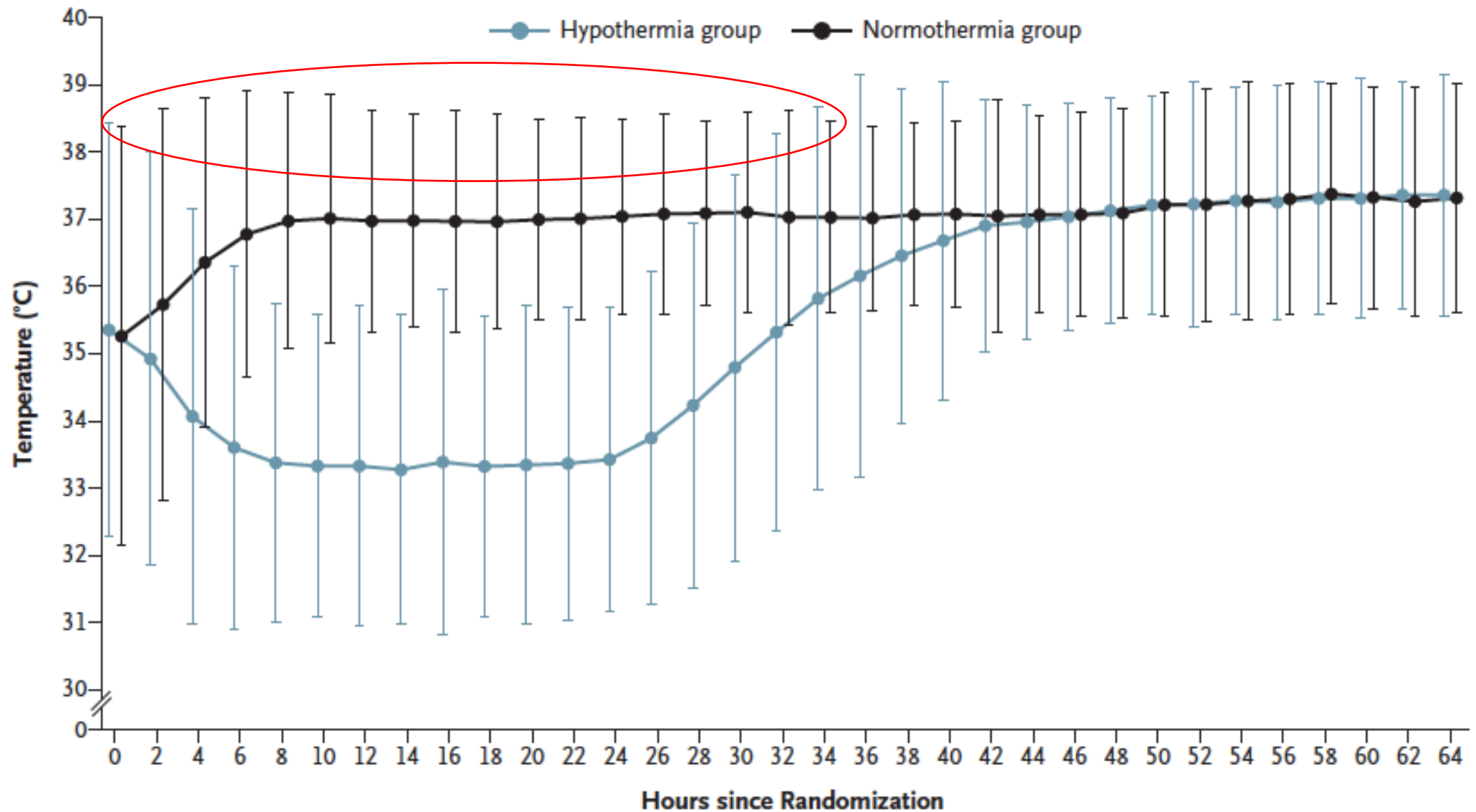
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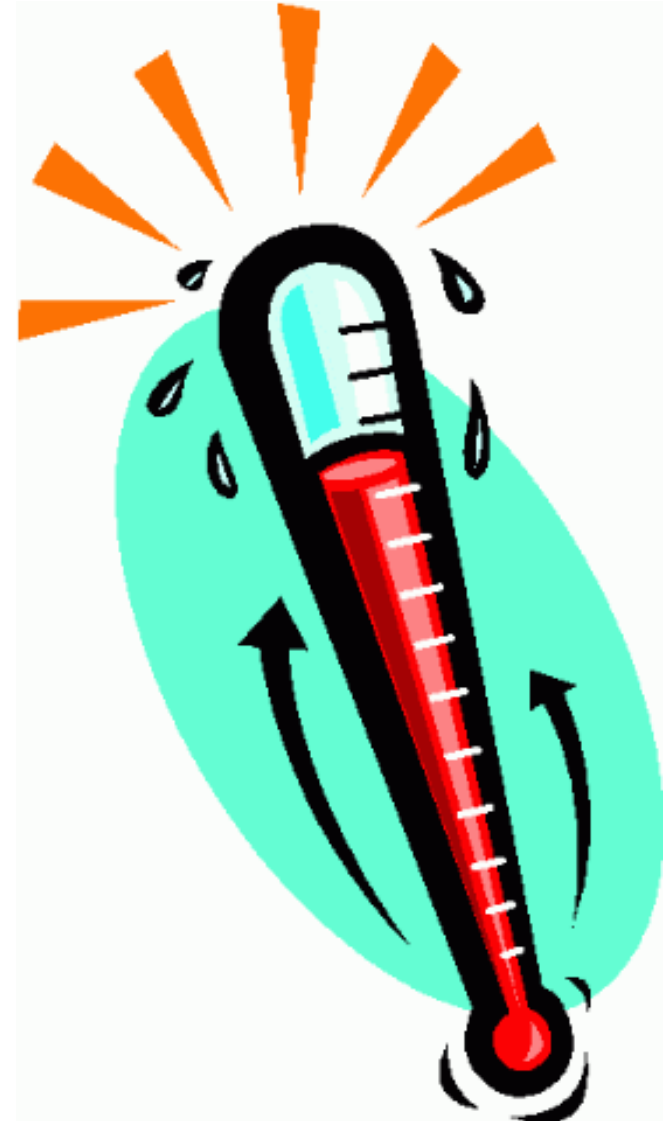
- **The HYPERION Trial**
- Mortality: No statistical difference (81.3% vs 83.2%).
- Survival with good neurologic outcome: 10.2% of the hypothermia groups and 5.7% of the normothermia group (absolute difference 4.5%, 95% CI 0.1-8.9%, $p=0.047$)
- **Better neurological outcome in the hypothermia group.**



The HYPERION Trial



FEVER IS BAD



Summary

- All comatose cardiac arrest patients with ROSC should have their temperature controlled.
- The target should be between 33 - 36 °C
- Consider your local resources and protocols
- Targeting a temperature $\leq 36^{\circ}\text{C}$ is reasonable and cost effective.

What is the perfect Temperature??

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THANK YOU

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